

CLIPPEDIMAGE= JP406294962A

PAT-NO: JP406294962A

DOCUMENT-IDENTIFIER: JP 06294962 A

TITLE: GRAY SCALE AND COLOR LIQUID CRYSTAL DISPLAY  
DEVICE

PUBN-DATE: October 21, 1994

INVENTOR-INFORMATION:

NAME

FUIRITSUPU, JIEE BOSU

ASSIGNEE-INFORMATION:

NAME

COUNTRY

SONY TEKTRONIX CORP

N/A

APPL-NO: JP06049709

APPL-DATE: February 23, 1994

INT-CL (IPC): G02F001/1335;G02F001/1335

ABSTRACT:

PURPOSE: To uniformly distribute intermediate transmission levels visually over a wide range without requiring pixels of many domains by uniforming optical transmission levels at a visual field and an azimuth angle to an optical axis by a symmetrical director area and a negative birefringent compensation plate.

CONSTITUTION: The gray scale and color CLD cell 80 is constituted by combining a liquid crystal cell which has the optical self-compensating symmetrical director area with the negative birefringent compensating plate 110 and

arranged between a couple of polarizers 112 and 114. In the symmetrical director area, a gray scale which is not uniform in symmetry or a color visual circular curve is generated by the liquid crystal cell. The negative birefringent compensating plate 110 reproduces the uniformity of the visual angle of the gray scale or colors. When a polar line is drawn, an optical transmission rate curve is a nearly concentric circle encircling an optical axis 130 at all azimuth angles and a  $\geq 30^\circ$  visual angle. For the purpose, a color filter is added to three color cells to uniformly sense the colors over the wide range of the azimuth angles and visual angles.

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CLIPPEDIMAGE= JP410197862A

PAT-NO: JP410197862A

DOCUMENT-IDENTIFIER: JP 10197862 A

TITLE: LIQUID CRYSTAL DISPLAY DEVICE AND PRODUCTION OF  
PHASE PLATE USED FOR  
THE SAME

PUBN-DATE: July 31, 1998

INVENTOR-INFORMATION:

NAME

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KUMAKAWA, KATSUHIKO

ASSIGNEE-INFORMATION:

NAME

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APPL-NO: JP09002814

APPL-DATE: January 10, 1997

INT-CL (IPC): G02F001/1335;G02B005/30

ABSTRACT:

PROBLEM TO BE SOLVED: To expand the visual field angle of a liquid crystal display device and to provide a process for production of inexpensive and high-performance phase plates used for expanding the visual field angle.

SOLUTION: This liquid crystal display device has a liquid crystal layer 1 in which liquid crystal molecules having positive refractive index anisotropy and position dielectric constant anisotropy are bend oriented at the time of

operation, the phase plates 6, 7 which are laminated on both sides of the layer and consist of optical media having negative refractive index anisotropy of hybrid oriented main axes and means for impressing voltage on the liquid crystal layer 1. The product of the refractive index anisotropy  $\Delta n$  of the liquid crystals and the thickness (d) of the liquid crystal cell 1 is specified to 790 to 1190nm. As a result, the dependence of the optical propagation characteristics of the liquid crystal cell 1 existing in an on or off state on visual field angles is compensated and the visual field angle characteristic of the liquid crystal display device is improved. A high-polymer network is formed while an electric field or magnetic field is impressed on the mixture composed of the high polymer and nematic liquid crystals on the substrates subjected to an orientation treatment and thereafter, the nematic liquid crystals are replaced with discotic liquid crystals, by which the phase plates 6, 7 are manufactured.

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